

TITLE OF THE INVENTION

PRESS AND METHOD OF CONTROLLING THE PRESS

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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C. §119 of German Patent Application No. 101 02 535.1, filed on January 19, 2001, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The invention relates to a press for processing a paper, cardboard, tissue or another fibrous material web with at least one nip formed by two press rolls, through which a belt runs next to the fibrous material web on each side, in which the fibrous material web is guided after the nip over a sandwich stretch jointly by both belts and the relevant control processes.

2. Discussion of Background Information

[0003] Such presses for dewatering fibrous material webs have been known for a long time and, particularly in an embodiment with long nips, are linked to a high dewatering capacity. The sandwich stretch thereby also guarantees safe guidance of the fibrous material web even at high web speeds.

[0004] The drive capacity is mainly produced by a press roll and, possibly, the belt running around this press roll.

[0005] Strains on the fibrous material web occur in the sandwich stretch as a result of differing speeds of the belts, that can lead as far as damage to the fibrous material web. Furthermore, differences in the tension of the two belts also result in differing adhesive behavior between the fibrous material web and the belts and a shearing load on the web, which renders difficult the secure guidance of the fibrous material web after the sandwich stretch and impairs quality. As a result, creases and crushing, for instance, can occur. The differences in tension of the belts have a particularly adverse

effect in the sandwich area after a shoe press, as a result of the long, intensive press time.

SUMMARY OF THE INVENTION

[0006] It is therefore an object of the invention to combat the stated disadvantages with these presses.

[0007] According to the invention both belts outside the nip are assigned at least one belt drive each. By driving both belts, the tension and speed differences between the belts are considerably reduced, which reduces the strain on the fibrous material web and improves its adhesive behavior with regard to the belts.

[0008] Due to the higher dewatering capacity, the nip should be embodied extended in the web travel direction and preferably formed by a shoe press roll and a cylindrical mating roll. To accept and transport the water that is squeezed out in the nip, at least one, and preferably both of the belts should be embodied as air-permeable, water-absorbent press felts.

[0009] Guide rolls partially wrapped by the respective belt are particularly suitable as belt drives. However, the drive power can also be produced in the belt by other devices, e.g., a nip assigned only to the respective belt.

[0010] In order to prepare for the transfer of the fibrous material web to a following take-up element, one belt should be guided away from the fibrous material web after the sandwich stretch. This belt guided away can advantageously be driven by at least one guide roll arranged after the sandwich stretch. While it is guided away, the belt that guides the fibrous material web alone after the sandwich stretch together with the outer fibrous material web should wrap a preferably driven guide roll. In order to improve the guidance of the fibrous material web thereby, the belt that guides the fibrous material web alone should be embodied as an air-permeable, water-absorbent press felt and the guide roll wrapped by it should be suctioned. However,

it is also possible that the belt that guides the fibrous material web alone should be embodied as a non- or only slightly water-absorbent and a non- or only slightly air-permeable transfer belt.

[0011] Afterwards the belt that guides the fibrous material web alone in both cases can transfer the fibrous material web to a take-up element preferably in the form of another belt. It is advantageous here if the belt is guided over a driven guide roll after transferring the fibrous material web.

[0012] The transfer of the fibrous material web can also be supported by the belt accepting the fibrous material web being embodied as moister and/or less air-permeable than the transferring belt.

[0013] In order to minimize the strain on the fibrous material web in the sandwich stretch, the belt drives of each belt following the nip should be controlled depending on the tension and/or speed of the belts. This, of course, assumes the tension or speed of the belts is measured in the critical area, i.e., in and after the sandwich stretch. This should occur in particular in the belt drives directly following the sandwich stretch.

[0014] In order to reduce the risk of breaking regarding the fibrous material web and to improve the adhesion to the belt that guides it alone, the belt that guides the fibrous material web alone after the sandwich stretch should have a higher speed after the nip than before the nip and/or the belt that guides the fibrous material web alone after the sandwich stretch should feature a higher tensile stress in the web travel direction after the nip than before the nip. It is advantageous here if the speed of the belt after the nip is up to approximately 4% higher, preferably between approximately 0.1 and approximately 0.3% higher, than before the nip and/or the pull of the belt is up to approximately 6 KN/m higher, preferably between approximately 0.2 and approximately 1.2 KN/m higher, than before the nip.

[0015] However, it is also possible for the belt in the form of a press felt after the

sandwich stretch jointly with the outer fibrous material web to wrap a fixed and suctioned guide element. This guide element is perforated on the side towards the press felt, whereby the interior is linked with an underpressure or suction source.

[0016] In connection with this, but also independent of it, the guide roll in the area of guiding away the other belt should be driven at a slower speed than the guide roll arranged after the transfer of the fibrous material web. This increases the tension of the guiding belt in the section between the guide rolls. As a result the adhesion of the fibrous material web to the belt is improved, so that it counteracts a tugging at the edges while the other belt is guided away.

[0017] The invention also provides for a press for processing a web comprising at least one nip comprising a first press roll and a second press roll. A first belt runs through the at least one nip. A second belt runs through the at least one nip. A sandwich stretch is formed by the first and second belts and is arranged after the at least one nip. A first mechanism is used for driving the first belt. A second mechanism is used for driving the second belt.

[0018] The at least one nip may allow the first belt, the second belt and the web disposed therebetween to travel therethrough. Each of the first and second mechanisms may be arranged after the at least one nip. The web may comprise one of a paper web, a cardboard web, a tissue web, and a fibrous material web. The at least one nip may comprise an extended nip. The first press roll may comprise a shoe press roll and the second press roll may comprise a cylindrical mating roll. At least one of the first and second belts may comprise an air-permeable water-absorbent press felt. The first mechanism may comprise a first guide roll and the second mechanism may comprise a second guide roll. The first belt may be guided away from each of the web and the second belt after the sandwich stretch.

[0019] The first mechanism may comprise a driven following guide roll that guides away the first belt. The second belt may be adapted to guide the web alone after the sandwich stretch. The second mechanism may comprise a driven guide roll that guides away the web and the second belt. The second belt may comprise an air-permeable water-absorbent press felt and the driven guide roll may be suctioned. The second belt may comprise at least one of a non-water absorbent belt, a slightly water-absorbent belt, and a non-air-permeable transfer belt and a slightly air-permeable transfer belt. The second belt may comprise at least one of an air-permeable press felt and a water-absorbent press felt. The second belt may be guided, after the sandwich stretch, over at least one of a fixed guide element and a suctioned guide element.

[0020] The second mechanism may comprise at least one of a fixed guide element and a suctioned guide element. The press may further comprise a take-up element arranged after the sandwich stretch, wherein the second belt is adapted to transfer the web to the take-up element. The take-up element may comprise a third belt. The press may further comprise a driven guide roll arranged downstream the take-up element, wherein the second belt is adapted to transfer the web to the take-up element and thereafter be guided by the driven guide roll. The press may further comprise a control unit coupled to the first and second mechanisms. The press may further comprise a control unit for controlling the first and second mechanisms. The press may further comprise a first sensor for use in controlling a speed of the first mechanism. The press may further comprise a second sensor for use in controlling a speed of the second mechanism. The press may further comprise a control unit for controlling the first and second mechanisms, the control unit receiving inputs from each of the first and second sensors. Each of the first and second mechanisms comprise a belt drive.

[0021] The invention also provides a method of controlling a tension and/or a speed of at least two belts in a press that comprises at least one nip comprising a first press roll and a second press roll, a first belt running through the at least one nip, a second belt running through the at least one nip, a sandwich stretch formed by the first and second belts being arranged after the at least one nip, a first belt drive for driving the first belt, and a second belt drive for driving the second belt, the method comprising driving the first belt at a first speed, and driving the second belt at a second speed, wherein the first speed is substantially the same as the second speed at least in a region of the sandwich stretch.

[0022] The method may further comprise moving the first belt, the second belt and the web disposed therebetween through the at least one nip before the sandwich stretch. Each of the first and second belt drives may be arranged after the at least one nip. The web may comprise one of a paper web, a cardboard web, a tissue web, and a fibrous material web. The at least one nip may comprises an extended nip. The first press roll may comprise a shoe press roll and the second press roll may comprise a cylindrical mating roll. The method may further comprise controlling the first and second belt drives. The method may further comprise driving the second belt at a third speed after the second belt passes the second mechanism. The third speed may be greater than the first and second speeds.

[0023] The method may further comprise separating the first belt from the web after the sandwich stretch and driving the second belt at a third speed after the second belt passes the second belt drive. The third speed may be greater than the second speed. The third speed may be as much as approximately 4% greater than the second speed. The third speed may be between approximately 0.1% and approximately 0.3% greater than the second speed. The method may further comprise separating the first belt from the web after the sandwich stretch and driving at least one of the first and

second belts after the sandwich stretch at a third speed which is greater than a speed of the first and second belts before they enter the at least one nip. The third speed may be greater than at least one of the first and second speeds. The third speed may be as much as approximately 4% greater. The third speed may be between approximately 0.1% and approximately 0.3% greater.

[0024] The method may further comprise subjecting the second belt to a tensile stress after the sandwich stretch. The second belt may support the web during the subjecting. The second belt may experience a higher tensile stress after passing through the at least one nip than before passing through the at least one nip. The higher tensile stress may be as much as 6 KN/m higher. The higher tensile stress may be between approximately 0.2 KN/m and approximately 1.2 KN/m higher.

[0025] The method may further comprise controlling each of the first and second belt drives. The method may further comprise controlling at least one of a speed and a tension of at least one of the first and second belts. The method may further comprise controlling at least one of a speed and a tension of the first and second belts by controlling the first and second belt drives. The method may further comprise controlling at least one of a speed and a tension of the first and second belts by controlling the first and second belt drives, whereby the first and second belt drives are controlled in a manner which minimizes a strain on the web. The method may further comprise transferring the web to a pick-up element after the second belt drive. The method may further comprise guiding away the first belt after the sandwich stretch. The method may further comprise driving the second belt at a greater speed than the first belt after the second belt transfers the web to the pick-up element.

[0026] The invention further provides for a press for processing a web comprising at least one nip comprising a first press roll and a second press roll, a first belt running through the at least one nip, a second belt running through the at least one nip, a

sandwich stretch formed by the first and second belts being arranged after the at least one nip, a driven guide roll for driving the first belt, the driven guide roll being arranged after the sandwich stretch, a driven suctioned guide roll for driving the second belt, the driven suctioned guide roll being arranged after the sandwich stretch, and a system for regulating and/or controlling a speed of each of the first belt and the second belt.

[0027] Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The present invention is further described in the detailed description which follows, in reference to the drawing by way of a non-limiting example of an exemplary embodiment of the present invention, in which like reference numerals represent similar parts throughout the drawing.

[0029] The figure shows a schematic cross section through a paper machine press according to the invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0030] The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

[0031] The press comprises here only one nip, but other press arrangements of the same or different kinds can also follow without any problems. The nip is formed by a shoe press roll 6 and a driven, cylindrical mating roll 7. To realize a nip extended in the web travel direction 5, the shoe press roll 6 comprises a flexible roll jacket that is pressed over a pressing shoe with concave pressing surface towards the mating roll 7. The driven mating roll 7 is wrapped here by a belt 3 that guides the fibrous material web 1 alone after a sandwich stretch 11. However, it is also possible for the mating roll 7 to be wrapped by the other belt 2.

[0032] To ensure an even and intensive dewatering, each belt 2, 3 is in the form of an air-permeable and water-absorbent press felt and is guided through the nip with the fibrous material web 1 therebetween. The press felts 2 and 3 are used to accept and transport away the water pressed out in the nip.

[0033] To guarantee a secure guidance of the fibrous material web 1, particularly at high web speeds, after the nip the fibrous material web 1 is guided over a sandwich stretch 11 jointly by both belts 2, 3. After the sandwich stretch 11, the upper belt 2 here is guided away from the fibrous material web 1. Afterwards, this belt 2 wraps a driven guide roll 8 that thus acts as belt drive 4.

[0034] Together with the outer fibrous material web 1, the lower belt 3, which guides the fibrous material web 1 alone after the sandwich stretch 11, wraps a driven suctioned guide roll 9. This driven and suctioned guide roll 9 also acts as a belt drive 4. The suctioned guide roll 9 has a perforated roll jacket, the interior of which is connected to an underpressure or suction source. This suctioning increases the adhesion of the fibrous material web 1 to the lower guiding belt 3.

[0035] After this, the lower guiding belt 3 transfers the fibrous material web 1 to a take-up element 12, which can be in the form of a belt which wraps a driven and

suctioned guide roll 13, and may especially be a press felt or a drying screen of a following unit of the paper machine.

[0036] After transferring the fibrous material web 1 to the take-up element 12, the lower belt 3 is likewise guided over a driven guide roll 10.

[0037] To control or regulate the belt drives 4, a speed of the belts 2 and 3 is recorded, and/or measured, and/or sensed by sensors 13 and 13' with sensor 13 sensing the speed of the upper belt 2 and sensor 13' sensing the speed of lower belt 3. The measurement readings of these sensors 13 are sent to a control unit 14. This control unit 14 influences, controls and/or regulates the belt drives 4 of each of the guide rolls 8, 9, 10. This occurs with the belt drives 4 directly following the sandwich stretch 11 such that the strain on the fibrous material web 1 produced by the belts 2,3 is minimized. As a result of this design, the sandwich stretch 11 can have substantially the same speed with regard to both belts 2, 3. Such an arrangement counteracts shearing and friction forces between the fibrous material web 1 and the belts 2,3.

[0038] Moreover, the guide roll 10 arranged after the transfer of the fibrous material web 1 can be driven more quickly than the suctioned guide roll 9, so that the belt 3 is stretched between the guide rolls 9 and 10. Such a design counteracts the separation, in particular of the web edges of the fibrous material web 1, after the upper belt 2 is guided away from the web 1.

[0039] It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as

amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.